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ABSTRACT

Grants for computer-oriented programs on college campuses are examined. The general pattern of funding during 1982 and grant programs of several foundations are addressed. The ways that colleges have used grant funds for computing activities are described through a series of case studies. Attention is directed to funding patterns across foundations and the experiences of six colleges that received grants from the Exxon Education Foundation. Study data were obtained from the "Foundation Grants Index." The six Exxon Foundation projects focused on computer literacy, faculty development, and curriculum redesign. Based on the Index, the 10 foundations that made more than three grants for computing to colleges are identified, along with the amount of the awards. A classification of the grants by use is also provided, which covers the following borad categories: academic (instruction and research), administrative, library, and other (unknown). Within these categories, the following uses of the grants are also indicated: hardware, software, facilities, research, and other. It is noted that slightly over half the grants awarded in 1982 were for academic computing, while grants for hardware consumed the largest percentage of external funds, followed by facilities. (SW)

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Funding the Computer Revolution:

Using External Resources for Academic Computing

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This paper was presented at the Annual Meeting of the Association for the Study of Higher Education held at the Conrad Hilton Hotel in Chicago, Illinois, March 12-14, 1984. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Abstract

This paper examines grants for computer-oriented programs on college campuses. It first outlines the major grant programs from foundations such as the Pew Memorial Trust and the Exxon Education Foundation. It then discusses past foundation funding practices. Through a series of case studies the paper examines the actual experiences of six colleges that received grants for computing activities. The paper draws conclusions about how the colleges use external funds and what other campuses can learn from those who have received grants.

There is little doubt that higher education is in the midst of a computer revolution. Any professional in the field is constantly assailed by accounts in the popular press and scholarly journals of computer literacy. Often these articles do not address a major issue: who pays for new computer equipment, software used in instruction, and training to help faculty members integrate computing into their courses. Many institutions find their options to expand computing limited by scarce resources. Furthermore, between 1966 and 1976, the last year for which data are available, the proportion of computing expenses colleges and universities provided increased from 56 to 82 percent (Alcorn, 1980). Recent estimates of the higher education computing market place it at $1.3 billion dollars a year and expect it to grow to $2 to $8 billion dollars (Turner, 1984a). Institutions spend approximately one-half of this amount on academic computing. Yet Robert Gillespie (1981) has described the influx of computing onto the college campus as an "accidental revolution." He cited the lack of comprehensive planning for the use of computing, knowledgeable faculty members to teach in an increasingly computerized environment, and secure funding sources.

Many foundations have made sizeable grants for academic computer innovations which address the problems Gillespie listed. The grants provide secure funding, retrain faculty, and support planning efforts. Some foundations have targeted their efforts on particular types of colleges and issues. The Exxon Education Foundation has funded computer-oriented programs at liberal arts colleges, for example. Some foundations have supported computing only if it is incorporated into a program which has another primary purpose. The Sloan Foundation's

program in the "New Liberal Arts," for example, encourages teaching applied mathematics and technology on liberal arts campuses. Institutions, however, have made extensive use of computing in the context of applied mathematics and technology.

The external grants are of interest because sufficient resources are an important part of the innovation process. Organizations without money, time, and personnel are less likely to implement innovative programs (Aiken & Hage, 1968; Corwin, 1972; Baldridge, 1975). This paper examines external funding and computing in higher education. Specifically, it discusses past foundation funding practices. The paper examines the general pattern of funding during 1982 and grant programs of several foundations that are particularly active in the area of computing. Second, it examines how colleges have used the funds they have received. It does this both in terms of funding patterns across foundations and at six colleges that received grants from the Exxon Education Foundation. Third, the paper draws conclusions about the grant programs and their influence on the college campus.

Method and Data Sources. The paper uses data from several sources. First is a review of foundation grants awarded in 1982. As Cheit and Lobman (1979) noted, information on foundation support for higher education is scarce. Data for this study were obtained from the Foundation Grants Index (Levine & Garonzik, 1983). While this source does not list all grants, it is the most comprehensive source available on grants of over $5,000 which includes information on the grants' purposes. The Index lists grants awarded by the 100 largest foundations

in the country and those reported voluntarily by other foundations. Data from annual reports and telephone interviews supplemented and brought up-to-date information on the foundations most active in the computing area.

Second is an analysis of six projects funded by the Exxon Education Foundation which focused on computer literacy, faculty development, and curriculum redesign. Review of the grant proposals described what was proposed and discussions with campus participants uncovered what actually occurred. The site visits for each case study involved two days of interviews with members of campus constituencies who have an interest in computing--faculty, administrators, and students. An open-ended interview format provided the basis for questioning. In addition to the interviews, documents related to the grant programs provided background information and quantitative analyses of academic computing.

Foundation Funding Practices

The Foundation Grants Index (Levine & Garonzik, 1983) lists 124 grants for computing and higher education. Fifty-three of the 448 foundations included in the Index made grants for computing totalling over fifteen million dollars in 1982. This is approximately six percent of the grants to higher education listed in the Index. The grants ranged in size from $5,000 to two million dollars. The median grant was $50,000. Table One lists the ten foundations that made more than three grants for computing in higher education. (The Council for Library Resources used resources it received from other foundations to support computer applications for college and university libraries.)

Table One
Foundation Grants in Computing and Higher Education

Foundation	(n)	Total Awards	Median Grant	Maximum Grant
Kellogg Foundation	(7)	2,765,372	88,000	2,042,248
Pew Trust	(17)	2,332,800	1,50,000	300,000
Lilly Endowment	(4)	1,737,120	492,075	500,000
Murdock Trust	(7)	1,409,470	150,000	500,000
Exxon Foundation	(9)	713,388	45,000	350,000
Sloan Foundation	(8)	387,500	24,500	150,000
Council for Library Resouces	(6)	199,789	21,480	11,300
Ford Foundation	(3)	138,194	52,891	65,303
GM Foundation	(3)	59,103	20,000	33,103
Shell Foundation	(6)	45,000	7,500	7,500
Other Foundations	(54)	5,338,750	40,000	1,000,000
Total	(124)	15,126,486	50,000	

The Index gives a short description of the purpose for most grants listed. Those dealing with computing can be classified along two dimensions. First is what category of computing the grant supports -- academic (instruction and research), administrative, library, or other. The grants can also be classified according to the type of activity they support. The activities include acquiring hardware and software, remodeling or expanding facilities, research on some aspect of computing, or other activities. Table Two shows the proportion of proposals and awards, and the value of grants according to this classification scheme. "Other" includes those grants in which the category and activity were not stated.

Slightly over half the grants awarded in 1982 were for academic computing. The figure may actually be somewhat higher because some grants in the "other" category were probably for academic computing. Administrative projects, on the other hand, comprised only two percent of the funded grants. The library projects also accounted for only a

Table Two
Computing Grant Classifications

		No. of Proposals	% of All Proposals	Median Award	Total Awards	% of All Awards
Academic	Hardware	14	11	40,329	1,603,228	11
	Software	13	11	45,000	624,157	4
	Facilities	10	8	250,000	3,335,000	22
	Research	1	1	95,000	9,500	0
	Other	27	22	50,000	2,291,940	15
		65	53	50,000	7,863,825	52
Admin	Hardware	2	2	1,00,000	200,000	1
	Software	1	1	30,142	30,142	0
	Facilities	--				
	Research	--				
	Other	--				
		3	2	50,000	230,142	2
Library	Hardware	--				
	Software	3	2	78,000	205,000	1
	Facilities	--				
	Research	6	5	21,480	199,789	1
	Other	4	3	68,900	484,800	3
		13	11	47,000	889,589	6
Other	Hardware	14	11	135,000	4,567,173	30
	Software	6	5	44,261	458,625	3
	Facilities	3	2	25,000	100,000	1
	Research	6	5	25,000	259,617	2
	Other	14	11	26,000	757,515	5
		43	34	49,767	6,142,930	41
Total		124	100		15,126,486	100

small percent of all grants. It is readily apparent that the foundations prefer to support academic applications.

Along the second dimension of the classification scheme, grants for hardware consumed the largest percent of external funds (42 percent). Facilities accounted for 23 percent of the funds awarded. The median grant for hardware was $71,638 and the median grant for facilities was

$200,000. Yet while these two activities accounted for 65 percent of the funds, they comprised only 34 of the funded proposals. This clearly reflects the expense of hardware acquisition and computer facilities. Software, on the other hand, was requested in 19 percent of the grants but accounted for only 9 percent of the funds with a median grant of $45,000. Research grants were 11 percent of the proposals and only 3 percent of the awarded funds with a median grant of $20,960.

Foundations award funds according to several strategies. Some, such as the Exxon Education Foundation and the Pew Memorial Trust, work primarily with unsolicited proposals in several broad categories. They consider requests for computing along with the others they receive. This is not to say, however, that they operate without guidelines. Pew, for example, tends not to fund requests only for equipment, although it made grants for this purpose several years ago. Pew currently focuses on liberal arts colleges and has interests in faculty, curriculum, and software development.

Other foundations operate with more specific guidelines. The Kellogg Foundation and the Murdock Charitable Trust illustrate this category. They either set their own priorities or do so in cooperation with the institutions they serve. In both cases, however, funds are awarded to projects that fall within the foundation's stated priorities. Kellogg, for example, funded seventeen institutions for computer-based adult learner services as part of its interest in adult continuing education.

Finally, foundations such as the Sloan Foundation, the Northwest Area Foundation, and the Lilly Endowment announce particular grant

programs and Requests for Proposals. (Although not listed in the previous tables, the Northwest Area Foundation is included here because it initiated a grant program for academic computing in 1983 under which it will make grants totalling $600,00 a year.) These foundations evaluate forthcoming proposals with others for the same program. The Sloan program for the "New Liberal Arts" is an example of a program that has operated in this fashion. The Northwest Area Foundation currently has a program to provide assistance to institutions in the general area of academic computing. This is unusual because computing is typically funded as part of a larger project such as faculty or curriculum development.

Private foundations are not the only source of external support for academic computing. In 1981 corporate contributions to higher education were approximately $2.9 billion (Smith, 1983). Computer manufacturers are part of this support. While specific data in this area are difficult to obtain, estimates are available for several firms. The first way these businesses support computing is through discounts on equipment. Such discounts, ranging up to 60 percent, are available to most institutions. While the discounts do not explicitly provide additional funds, they enable institutions to save considerable sums. A recent example of such discount programs is Apple Computer's decision to sell the new Macintosh computer to a group of 30 colleges and universities for $1,500 below the list price of $2,500 (Turner, 1984b).

Because the computer firms rely on higher education to supply engineers and computer scientists, they also award grants to assist departments and programs in these fields. IBM, for example, awards

grants of $25,000 to departments that it feels are worthy. It also has a faculty development program in the engineering, computer science, and material science fields in which 100 faculty each year receive grants of $30,000. And IBM provides 200 Graduate Fellowships worth $10,000 each to graduate students in science and engineering. These students' departments recieve $2,000 as part of the same program. Additional grants support faculty research efforts which reflect the companies' interests in developing new technologies and supporting critical work in computer-related fields (Turner, 1984a). Foundations such as the Shell Companies Foundation also provide funding to students, faculty, and departments in disciplines that support the parent companies' business interests.

Thus there are a variety of sources of external funding available to colleges and universities to support computing efforts. Institutions use these funds for a number of purposes, some of which are of their own initiative and others which grow from the funding source's programs or priorities. The remainder of the paper examines how six colleges have used external funds to support academic computing, and assesses the influence of external funding on academic computing.

The Influence of External Funding

This paper examines seven unsolicited proposals the Exxon Education Foundation funded between 1981 and 1983. Two of the proposals requested funds to develop software to support classes--one in calculus and one in geology. Two of the proposals were for general programs in "computer literacy" and included funds for hardware purchases, faculty involvement, and course development. The remaining proposals focused

on faculty retraining and development activities. Two of these were specifically designed for computer science faculty as well as faculty from other disciplines. Although each proposal reflected the special needs of an individual campus, all were directed at helping the institutions reach new goals for computing.

One of the proposals was eliminated from further study because the grant was quite recent and the college has not yet fully implemented its program. Site visits at five of the colleges and telephone interviews at the sixth were the primary means of data collection. (The six institutions were Colby College, Hamline University, Marymount College, Smith College, Swarthmore College, and Wells College.) Documents relating to the grant projects supplemented the interviews.

One college has completed its project and the others are at various stages of implementation. Progress has not always been as fast as project directors might like, but each is pleased with progress to date. In general, plans have proceeded as expected. Most of the projects were not dependent on specific hardware or software. In fact, the colleges tended to rely on well established technology for most of their projects. New applications with graphics were the major exception.

Although the proposals are unique in their goals and methods, commonalities related to the external funding exist in the colleges' experiences with the projects. At the most fundamental level the grants provided resources required for new initiatives. They permitted the recipients to make progress in the area of computing. In some cases faculty members thought that they would be engaged in the same activities regardless of the funding, but they would not have prog-

ressed so far as quickly. The grants provided breathing room and enough "slack" resources for some safe experimentation. As the research literature on innovations suggests, additional resources aid the innovation process (Aiken & Hage, 1968; Corwin, 1972; Baldridge, 1975).

The most obvious resource the grants provided was money. The recipients used this for purchasing hardware or software, and as a motivating force for involving faculty. Paying faculty members for their participation in classes on computing or for projects to write or adapt software for classroom use was a common means of legitimizing such activities. Without payment some faculty members would not have pursued the activities, although others felt that payments were not required to interest faculty members in computing activities.

The grants also provided time, one of the most frequently mentioned benefits of external funding. Several of the institutions used grant funds for release time for the faculty member in charge of the grant. Project directors used this time for planning activities related to the grant, for designing courses, and for their own retraining. Particularly at small liberal arts colleges which have heavy teaching loads, release time was extremely valuable.

Both the time and money enabled project directors and other interested faculty members on the campuses to become more heavily involved with computing activities. The resources helped make these individuals available to others who needed assistanc with computing. Beyond this the project directors provided coherence and drive which propelled the projects forward. Their perseverance, commitment, energy, and enthusiasm were factors that encouraged progress.

If the grants provided the resources which permitted the institutions to advance, there often were other factors that hindered progress. While additional time and money facilitated progress, the grants were not limitless. Most of the campuses could have used additional resources. There never was enough money to fund all of those interested in the project, or to purchase all of the hardware or software that might have been useful. But this problem is not limited to computing alone.

Perhaps a more troublesome problem was motivating those faculty members who were not interested in computing and the grant projects. Part of this is a question of inertia. Faculty members established in their teaching habits may find it difficult to change courses to take advantage of new technology. Adding material about computing or using computer resources usually means removing or reducing some other section of course content. This is a difficult task. Summer stipends or paying faculty to attend computer literacy courses is one means of involving faculty but such rewards do not guarantee on-going commitment to computer use.

There are several interesting and unexpected effects of external funding. First grants often have multiple effects in addition to their stated purpose. Three of the colleges used their experience with the Exxon grant to attract additional external resources. The Exxon projects demonstrated interest in computing and skill in building a computer literacy program. The colleges have used the additional grants they received to extend the Exxon projects or to expand into new areas.

Another result of the broad-based programs is a generalized increase in the level of understanding of computing on the campus. While the grant projects may focus on academic computing, at several campuses they initiated other changes in computer use. This included administrators who have expanded their limited experience with computing or support staff who now use word processing.

Finally, activity surrounding the grant projects affected the nature of faculty interactions at some institutions. In several cases faculty members communicated more frequently with others on the campus whom they had previously not dealt with. A shared interest in computing joined faculty members across departments and disciplines. Faculty members who participated in computer literacy classes also had the rare opportunity to see their colleagues in a learning situation. This is unusual for organizations where faculty members are more typically viewed as experts in their field.

Conclusion

External funds are only a small part of the total funding for computing on college and university campuses. But the grants are useful at colleges which may lack resources and knowledge of computing. At the colleges examined in this paper, the funds allowed each campus to learn more about computing and its application in a particular environment. Without the grants innovation and new approaches to computer use would have been much less likely. Through the addition of "slack" resources, the grants also set in motion a process which helped the recipients attract other funds and develop new programs. Thus the external grants helped the institutions counteract

the problems associated with the "accidental revolution" -- lack of planning, knowledge, and funding.

Yet external funding sources do not appear to reduce the sense of chaos also present in the characterization of an "accidental revolution." Even those foundations which have general priorities or particular programs fund diverse projects in which campus' pursue their own goals in unique programs. While there are common themes in the funded projects and computer use, such as faculty development and increasing reliance on word processing, institutions still define their own computing priorities. Campuses direct their resources to particular applications and support different notions of the appropriate use of computing in higher education. Because of the complex and ever changing nature of computing, however, this is not surprising. The current diversity, however, may become as acceptable as the diversity among the institutions themselves when the use of computer resources becomes less exotic and more commonplace.

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